SECTION 23 82 00
CONVECTION HEATING AND COOLING UNITS

PART 1 - GENERAL

1.1 DESCRIPTION

Fan-coil units, radiant ceiling panels, unit heaters, finned-tube radiation, air curtains **and gas-fired fireplaces**.

1.2 RELATED WORK

A. Section 23 05 11, COMMON WORK RESULTS FOR HVAC: General mechanical requirements and items, which are common to more than one section of Division 23.

B. Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT: Noise requirements.

C. Section 23 21 13, HYDRONIC PIPING: Heating hot water and chilled water piping.

D. Section 23 31 00, HVAC DUCTS AND CASINGS: Ducts and flexible connectors.

E. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Valve operators.

F. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING FOR HVAC: Flow rates adjusting and balancing.

1.3 QUALITY ASSURANCE

Refer to Paragraph, QUALITY ASSURANCE, in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Fan-Coil units.
2. Unit heaters.
3. Cabinet unit heaters.
4. Finned-tube radiation.
5. Radiant ceiling panels.
6. Air curtains.
7. **Gas-fired fireplaces**

C. Certificates:

1. Compliance with paragraph, QUALITY ASSURANCE.
2. Compliance with specified standards.

D. Operation and Maintenance Manuals: Submit in accordance with paragraph, INSTRUCTIONS, in Section 01 00 00, GENERAL REQUIREMENTS.

1.5 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. Air Conditioning and Refrigeration Institute (ARI):

440-05.....Room Fan Coils

C. National Fire Protection Association (NFPA):

90A-02.....Standard for the Installation of Air Conditioning and Ventilating Systems

70-05.....National Electrical Code

D. Underwriters Laboratories, Inc. (UL):

181-05.....Standard for Factory-Made Air Ducts and Air Connectors

1995-05.....Heating and Cooling Equipment

1.6 GUARANTY

In accordance with FAR clause 52.246-21.

PART 2 - PRODUCTS

2.1 ROOM FAN-COIL UNITS

A. Capacity Certification: ARI 440.

B. Safety Compliance: NEC compliant and UL listed.

C. Noise Levels: Operating at full cooling capacity, sound power level shall not exceed by more than 5 dB the numerical value of sound pressure levels associated with noise criteria specified in Section 23 05 51, NOISE AND VIBRATION CONTROL FOR BOILER PLANT. Select units at intermediate speed, for compliance with the noise criteria.

D. Chassis: Galvanized steel, acoustically and thermally insulated to attenuate noise and prevent condensation.

E. Cabinet Type: Not lighter than 1.3 mm (l8 gage) steel, reinforced and braced. Arrange components and provide adequate space for installation of piping package and control valves. Finish shall be factory-baked enamel in manufacturer's standard color.

1. Horizontal Unit: Hinged bottom access panel with cam-lock fasteners. Provide stamped integral discharged grilles in front of cabinet.

2. Concealed Units: Enclosed type with inlet and outlet duct collars.

F. Fans: Centrifugal, direct drive, galvanized steel or polyester resin.
   l. Motors: 3-speed ECM type with integral thermal overload protection, for operation at not more than l200 RPM.
   2. Provide a fan speed selector switch, with off, low, medium, and high positions. Switch shall have a set of auxiliary contacts which are open when the switch is in the "off" position and closed when the switch in any of the other positions. On vertical units, mount switch in a junction box in the cabinet of each unit. On horizontal units, switch shall be wall mounted.

G. Cooling and Heating Coils:
   1. Hydronic (two separate coils for cooling and heating): Copper tubes, 10 mm (three-eighths inch) minimum inside diameter, not less than 4.3 mm (0.0l7 inch) thick with copper or aluminum fins. Coils shall be pressure tested for bursting and strength in accordance with Underwriters Laboratories, Inc., requirements for pressure tested coils, and shall be designed to provide adequate heat transfer capacity. Provide manual air vent at high point of each coil and drain at each low point.
   2. Electrical heating coils: Spiral sheath or finned-tube construction with Cal-rod resistance elements in aluminum tubes. Units shall be UL listed and factory wired with unit mounted heat switch, magnetic contactors, high temperature cutout safety control, and fan override thermostat.

H. Piping Package: Furnished with unit by the manufacturer to fit control valves provided by the controls supplier. Submit manufacturer's detailed drawings of the piping in the end compartments for approval prior to fabrication of the piping packages. Provide ball stop valves on the supply and return pipes and balancing fittings on the return pipes.

I. Drain pans: Furnish galvanized steel with solderless drain connections and molded polystyrene foam insulating liner.
   1. Provide condensate pump and float controls for field installation and wiring.
   2. Auxiliary drain pan: Located under control valve and piping to prevent dripping.

J. Air Filter: Manufacturer's standard throwaway type, not less than one inch thick, supported to be concealed from sight and be tight fitting

to prevent air by-pass. Filters shall have slide out frames and be easily replaced without removing enclosure or any part thereof.

K. Control valves and unit mounted return air thermostats are to be field installed.

2.2 UNIT HEATERS

A. General: Horizontal discharge type for hot water heating medium, as indicated.

B. Casing: Steel sheet, phosphatized to resist rust and finished in baked enamel. Provide hanger supports.

C. Fan: Propeller type, direct driven by manufacturer's standard electric motor. Provide resilient mounting. Provide fan guard for horizontal discharge units.

D. Discharge Air Control:

1. Horizontal discharge: Horizontal, adjustable louvers.
2. Vertical discharge: Radial louver diffuser.

E. Hot Water Coil: Aluminum fins bonded to seamless copper tubing by mechanical expansion of the tubing, designed for 517 kPa (75 psig) steam working pressure.

2.3 CABINET UNIT HEATERS

A. General: Vertical or horizontal type for hot water heating medium, as indicated.

B. Cabinet: Not less than 1.3 mm (l8 gage) steel with front panel for vertical units and hinged front panel for horizontal units. Finish on exposed cabinet shall be factory-baked enamel in manufacturer's standard color as selected by the Architect. Provide 76 mm (3-inch) high sub-base for vertical floor mounted units.

C. Fan: Centrifugal blower, direct driven by a single phase, two-speed, electric motor with inherent overload protection. Provide resilient motor/fan mount.

D. Filter: Manufacturer's standard, one inch thick, throwaway type.

E. Hot Water Coil: Aluminum fins bonded to seamless copper tubing by mechanical expansion of the tubing, designed for 517 kPa (75 psi) steam working pressure.

F. Factory Mounted Controls: Manual fan starter and three-position (low, high and off) fan speed switch.

2.4 FINNED-TUBE RADIATION

A. Ratings: Certified under the I=B=R program of the Gas Appliance Manufacturer’s Association.

B. Enclosures: 1.6 mm (l6 gage) steel, sloping top, designed for wall mounting. Provide baked enamel finish in standard manufacturer's colors as selected by the Architect. End plates and corner pieces shall be die-formed with round edges and fit flush with enclosure surface. Where continuous wall-to-wall installations are shown on the drawings provide all fillers, corner fittings, sleeves, end caps and other accessories, which shall have the same profile as the basic unit. Provide access panels or extensions where required for access to valves, or traps shown on the drawings.

C. Hydronic Heating Elements: Steel pipe or nonferrous tubing with fins mechanically bonded by mechanical expansion of the tube. Elements shall be positively positioned front-to-back with provisions for silent horizontal expansion and contraction.

2.5 RADIANT CEILING PANELS:

A. Provide complete extruded linear and modular radiant panel ceiling systems in all areas as scheduled and detailed on the drawings and as specified.

B. Provide wall channels and support angles required to frame the ceiling openings. The ceiling openings shall provide for necessary expansion and contraction of ceiling panels. Install panels in finished openings and provide support steel and panel support channels. Cross channels shall be located on not more than thirty (30) inch centers.

C. The linear radiant ceiling panels shall consist of extruded V-grooved aluminum faceplate, 0.500" I.D. copper tubes and 1 inch thick fiberglass insulating blanket. The panels shall consist of interlocking extruded sections with galvanized steel channel cross braces attached by plated steel assembly clips. The copper tubing shall be mechanically bonded into an extruded aluminum saddle so that the tube is an intimate engagement with the saddles and provides efficient heat transfer. Furnish blank filler pieces at corners and other locations shown or required to form a continuous line. Panels shall be field cut, mitered and installed to conform to architectural features of ceilings and panel layout shown on drawings.

D. Each preassembled panel shall be factory painted white. The assembled panel consisting of individual sections shall be delivered to the job site and tagged for each location. Assembled panels shall be arranged for wall-to-wall installation or ceiling opening sizes and arrangement as noted on the drawings. Dimensions on drawings are for active length only and do not represent the full radiant panel length required for opening or wall-to-wall dimensions.

E. The non-radiant matching linear panels shall be fastened to the active radiant panels and shall provide a continuous surface. Cutting, mitering, suspending and fitting of the radiant panels shall be performed in accordance with the requirements of the panel manufacturer. These matching inactive panels shall be same color, texture and finish as the active linear radiant heating panels.

F. The modular ceiling panels shall be 2 feet by 4 feet in size designed to be installed in a lay-in acoustical tile ceiling. Panels fabricated of .040 inch thick nonperforated aluminum face plate with .500 inch O.D. serpentined copper tubing metallurigically bonded to the face plate. Also included shall be 1 inch thick, 3/4 PCF density glass fiber acoustical pad. Panel face plates shall be factory painted white. Where scheduled, custom painted of colors selected by the Architect and factory silk-screening to match adjacent acoustical ceiling tile pattern shall be provided. Coordinate requirements with the General Contractor. Submit samples of silk-screened patterns to the Architect for approval.

G. Hangers shall be installed as recommended by the manufacturer.

H. Interconnecting of radiant panels shall consist of .500" I.D. Type L soft copper tubing.

2.6 AIR CURTAINS

A. Housing Materials: Heavy-gage, aluminum construction.

1. Anodized Finish: Match finish and color of adjacent architectural metals. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

3. Mounting Brackets: Steel, for wall or ceiling mounting.

B. Intake Louvers: Integral part of the housing, mechanically field adjustable.

C. Discharge Nozzle: Integral part of the housing, containing adjustable air-directional vanes.

D. Fans: Galvanized steel, centrifugal, forward curved, double width, double inlet; statically and dynamically balanced.
   1. Fan Drives: Direct.
   2. Motor Type: Multispeed, resiliently mounted, continuous duty, totally enclosed, air over, with integral thermal-overload protection.
   3. Bearings: Permanently sealed, lifetime, prelubricated, ball bearings.
   4. Disconnect: Internal power cord with plug and receptacle.

E. Water Coils:
   1. Description: Continuous-circuit coil.
   2. Piping Connections: Threaded on same end.
   3. Tubes: Copper, complying with ASTM B 75.
      a. Tube Diameter: 0.625 inch.
   4. Fins: Aluminum with fin spacing 0.167 inch.
      a. Fin and Tube Joint: Mechanical bond.
   5. Headers: Seamless copper tube with brazed joints.
   6. Frames: Galvanized-steel channel frame, 0.052 inch.
   7. Ratings: According to ASHRAE 33.
      a. Working-Pressure Ratings: 200 psig, 325 deg F.
   8. Source Quality Control: Test to 300 psig and to 200 psig underwater.

F. Disposable Panel Filters: Factory-fabricated, viscous-coated, flat-panel-type, disposable air filters with glass-fiber media sprayed with nonflammable adhesive in cardboard frame.
   1. Mounting Frames: Welded, galvanized steel with gaskets and fasteners and suitable for bolting together into built-up filter banks.

G. Accessories:
   1. Built-in Thermostat: Line voltage, factory installed and wired to the junction box on air curtain.

2. Automatic Door Switch: Plunger type installed in door area to activate air curtain when door opens and to deactivate air curtain when door closes.
3. Start-Stop, Push-Button Switch: Manually activates and deactivates air curtain.
4. Time-Delay Relay: Factory installed and adjustable to allow air curtain to operate from 0.5 seconds to 10 hours.
5. Motor-Control Panel: Complete with motor starter, 115-V ac transformer with primary and secondary fuses, terminal strip, and NEMA 250, Type 1 enclosure.

2.7 GAS-FIRED FIREPLACES:

A. Vent-free natural gas fireplace: wall-mounted (non-recessed), vent-free, black glass/aluminum trim, efficiency = 99.99%, fuel ratings - 6,820-11,950 BTU/hr, inlet gas pressure = 6" w.g. min-10.5" w.g. max, manual rotary control, furnish with oxygen depletion sensor, Piezo type, ignition, adjustable flame height and heat intensity, location and installation as per manufacturer's specific requirements, 20-year limited warranty. Basis of Design: Lennox Hearth Sandium Model H6065, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Work shall be installed as shown and according to the manufacturer’s diagrams and recommendations.
B. Handle and install units in accordance with manufacturer's written instructions.
C. Support units rigidly so they remain stationary at all times. Cross-bracing or other means of stiffening shall be provided as necessary. Method of support shall be such that distortion and malfunction of units cannot occur.
D. Install 3-inch thick fiberglass blanket insulation above hydronic radiant panels.

3.2 OPERATIONAL TEST

Refer to Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

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